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U. Krieger, B. Halbedel, D. Hülsenberg

Electromagnetic Stirring of Glass Melts - Characterization of the Homogenization Effects

ELECTRO-PROCESSING TECHNOLOGIES

Starting from first experimental results the characterization of the homogenization of glass melts by the electromagnetic stirring effects due to the generation of so called artificial Lorentz forces was realised by in-situ measurements of the temperature distribution in the melts during the experiments [1]. The laboratory equipment consists of a special arrangement of two electrodes and a magnet system for the generation of a electric current and magnetic field in the glass melt (using crucible as vessel).

Additional experience created by the investigation of the effects resulting from a time dependent change of parameters (e.g. electric current density, magnetic flux density, direction of Lorentz force). This leads to the determination of the thermal homogeneity and enables to conclude the significant parameter settings for the experiments with respect to an optimized thermal homogenization of the glass melt by electromagnetic assisted mixing.

Since the direct measurement of the velocity distribution in the melt is not possible due to the high temperatures we investigated the mixing behaviour for two different cases. First a transparent and a coloured melt (similar material properties) are positioned in a layered arrangement which creats characteristic striae during mixing [2]. Second an inhomogeneous distribution of two glasses with a significant difference in the chemical composition acts as a starting point for the experiments. After mixing we analyzed the chemical homogenization effects of the electromagnetic mixing in the glass melt.

Utilizing representative parameters from this experiments (in according with mixing quality) enables the comparison with other technical processes and fields of research. Based on this knowledge the potentials for the optimisation and improvement of glass production using Magnetohydrodynamics are concluded.

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